

## Getting the drive to the wheels

In the early days of motorised trucking, it was common for the power produced by the engine and transmission arrangement to be sent to the rear, drive, wheels by chain as shown in this photo of a 1910 Belhaven. It did not take long however before this design was replaced by what we have now, a driveshaft connected to the output shaft of the gearbox and to a rear mounted differential that turns the drive through 90 degrees and transmits the power through the axle shafts to the wheels.

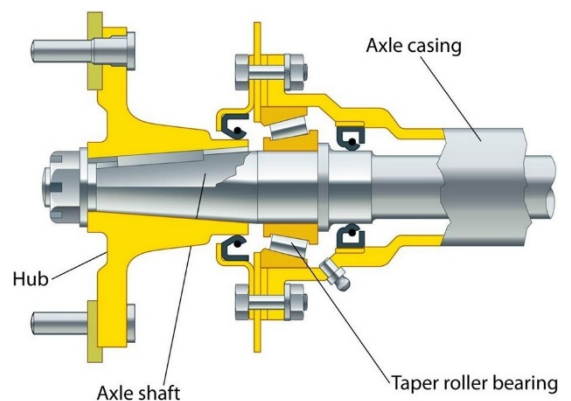


There are three common designs of axle shafts or half shafts as they are sometimes called, each is classified by the way they are mounted within the axle casing (housing) and the work they do.

### Semi-floating axle

In this design the outer end of the axle shaft passes through a bearing that is inside the axle housing. The weight of the vehicle is carried by the axle shaft through the bearing. A semi floating axle must be strong enough to withstand the:

1. Torque produced by the engine and transmitted to the driving wheels,
2. Retarding forces from the wheels when the brakes are applied
3. Side thrust imposed during cornering.



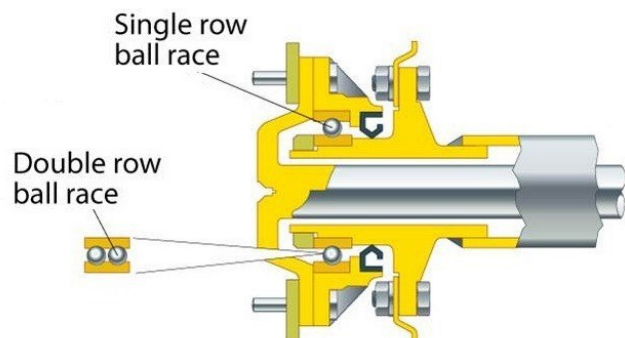
The wheels are attached to a hub fitted to the outer end of axle shaft. This hub is tapered and fitted with a keyway to prevent the axle spinning inside the hub.

### Three-quarter floating axle

Similar in design to the semi-floating axle except the weight of the vehicle is carried through bearing to the axle housing.

A three-quarter-floating axle shaft does not carry any weight of the vehicle but must still be strong enough to withstand the:

1. Torque produced by the engine
2. Braking forces
3. Side thrust imposed when the vehicle is cornering



As shown in this diagram the hub bearings used may be either single or double race.

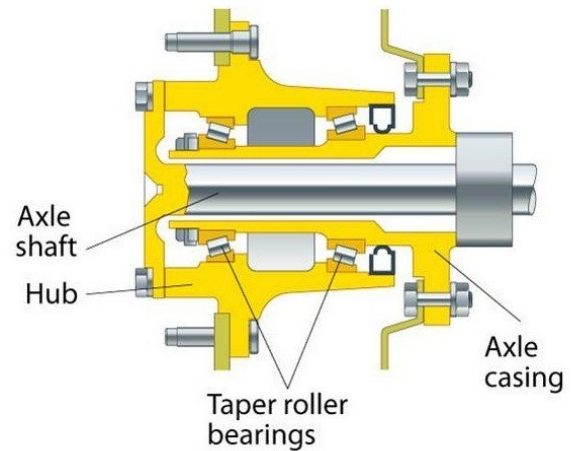
## Fully floating axles

The most common axle design used on trucks.

In this design the entire weight of the vehicle, side thrust, and braking forces are taken on the axle housing. The only forces that are carried by the axle shaft is the torque produced by the engine and used to move the vehicle.

The axle shaft passes through the wheel hub and is flanged so it can be bolted to the outside of the hub.

An advantage of this design over semi and three-quarter floating designs is that the axle shaft can be removed without lifting the vehicle off the ground and removing the wheels and hub allowing the wheels to effectively freewheel once the brakes are released. This can help if the vehicle must be moved to avoid damaging the differential, driveshaft, or gearbox.



Vehicles fitted with Carden shaft park brakes

If the vehicle has a Carden Shaft parking brake fitted removing one or more axle shafts will leave the vehicle without an effective parking brake. If the vehicle is stationary and, on a slope, when an axle is removed the vehicle can roll forward or backward so the wheels must be chocked first before the axle(s) are removed.

## What happens if an axle shaft breaks?

In a semi or three-quarter floating design if an axle shaft breaks the wheel attached to it can fall off. This cannot happen in a fully floating design.

Axle images retrieved from Blogmech <https://blogmech.com>